

## A Young-of-the-Year Giant Sea Bass, *Stereolepis gigas* Buries Itself in Sandy Bottom: A Possible Predator Avoidance Mechanism

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The adult giant sea bass, *Stereolepis gigas*, (GSB) is the largest teleost inhabiting California's shallow rocky reefs, attaining a length of about 2.3 m (7 ft) and a maximum weight of around 256 kg (563 lbs) (Baldwin and Keiser 2008). They range from Humboldt Bay, California to Oaxaca, Mexico, including the Gulf of California (Miller and Lea 1972). Adults consume a wide variety of prey and occupy rocky bottom habitat ranging from approximately 7–40 m (25–130 ft) of water (Miller and Lea 1972) and can forage over sandy bottom, away from rocky reefs (Baldwin and Keiser 2008). After their peak commercial catch in 1932, at just over 114,000 kg, the population quickly crashed and their numbers have remained depressed ever since; this has inhibited detailed research (Pondella and Allen 2008).

Young-of-the-year (YOY) GSB pass through various color phases and morphological changes during early development. These transitions help it to appear cryptic, while hiding to avoid predators during a vulnerable stage of life. When less than 2.5 cm (1 in), these YOY appear black with several small white spots around its face (Fig. 1). This black stage has very large black dorsal and pelvic fins, with transparent pectoral, anal, and caudal fins. The black juveniles morph through a "brown" stage, to a bright orange fish (Fig. 2). The black dorsal fin changes to orange, while the enormous pelvic fins remain black. Color expands outward to include half of the pectoral and anal fins, and the entire tail remains clear. The white spots remain from the earlier stages, and small black spots also appear (Pers. obs., and Benseman, unpublished data). These YOY appear to frequent open, sand and mud-bottomed habitat between 2–30 m (7–100 ft) for the first few months after settlement (Benseman, unpublished data).

During a focused SCUBA survey for YOY GSBs at Veteran's Park in Redondo Beach, Los Angeles County, California, Michael Couffer located a roughly 2.5 cm (1 in) long orange juvenile GSB in 5.5 m (16.5 ft) of water, floating upright in the bottom of a shallow sandy depression with its dorsal and pelvic fins closed. The bottom was clean sand without surface detritus. When approached, the GSB raised its dorsal and pelvic fins and left the depression, moving slowly within 30 cm of the bottom. The fish was photographed to record the sighting time in image metadata, and followed from about a meter away to acclimate the fish to human presence so that it could be photographed in profile.

After the fish had moved about 9 m, Mr. Couffer approached to half a meter to photograph its spot pattern. The fish startled, and darted toward the bottom at an angle. As the fish reached the bottom, it turned on its side at the last instant and buried into the soft sand by undulating its body like a flatfish. It pushed its head beneath the sand and undulated until the entire fish was buried in under three seconds. I took several photos of



Fig. 1. An 18mm YOY Giant Sea Bass from Newport Beach, California.



Fig. 2. A 75mm YOY Giant Sea Bass from Newport Beach, California.





Fig. 3. Scales on the side of the buried YOY Giant Sea Bass show through the sand to the left of the insert.

the exact spot where the GSB had disappeared (Fig. 3), and then put a 15 cm net over the spot, working the net's frame down into the sand. The fish remained buried. I dug my hand deep into the soft sand under the net, lifted a ball of sand containing the fish up into the net. As the sand fell away to the sides of the ball, the GSB burst out of the sand and up into the net. I measured the GSB at 32 mm, and released it. The GSB darted beneath me as I knelt on the sand. I pushed off the bottom, but the fish was gone.

The GSB's actions appeared to be a flight response, a possible last-ditch effort to evade predation in an area where there was no available cover for shelter. Unlike flatfish that may cover themselves with soft sediment to ambush their prey (Gibson and Robb 1991), or certain benthic gobiid fishes that have mutualistic relationships with shrimp that dig holes for shelters (Horinouchi 2008; Thacker et. al. 2011), this GSB was behaving as if actively trying to avoid detection by a "predator". Senioritas, *Oxyjulis californica*, are also known to bury themselves to avoid predators, but this occurs mostly at night, with the seniorita remaining buried for protection (Hobson, E.S. 1968), and not as an immediate escape response. This GSB predator evasion method should prove highly effective, as few predators could dig in the sand for the fish after burial. The bottom was so uniform that if the observer had looked away from the spot where the fish had buried, its location would have been lost (Fig. 3).

The open expanse of sand and mud bottoms that these small YOY GSB utilize make ideal nursery areas since there is an abundance of food, such as mysids and other arthropods (Dahl 1952), and relatively few inhabitants, including predators (McLachlan 1990). However, when a juvenile does encounter a predator, it must rely on its cryptic coloration and shape, and other types of active and passive predator avoidance strategies. The burying behavior observed may be a successful last-resort predator avoidance strategy for GSB, and is certainly the first one documented.

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